Iowa's Trauma System Registry Report 2015

Iowa Department of Public Health
Promoting and Protecting the Health of Iowans

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Figures

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Executive Summary

- 2,046 Iowa resident deaths
    - 73% unintentional, 20% suicide
    - Decrease in transportation deaths
    - Increase in falls and poisonings
- 28,218 hospital admissions
    - 49.7% of injuries in 65+ years
    - 52.1% from falls, 13.9% from suicide
    - 53.7% fractures, 10.4% internal organ injuries (61.3% TBIs)
    - 44.8% discharged home, 40.7% to extended care
    - Majority of ISS 16+ are internal organ injuries
    - 19.6% of ISS 16+ admitted to Level III-IV hospitals
- Trauma System Status
    - 5% of hospitals with trauma specialty capability
- EMS
    - 14,657 trauma transports (SEQIS pop./911 Calls only and Treated/Transported by EMS, n=1,960)
        - Cardiac arrest in transport 0.7%
        - Scene time 10+ minutes at 84.4%, 20+ minutes at 27.6%
- State Trauma Registry
    - 14,889 patients
    - Reporting was by all Resource and Regional hospitals and 90% of Area hospitals.
    - Indicators of performance were slightly improved for 2014 above the 5 year average.

Overview

In 1995, the state legislature established the Iowa Trauma Care System Development Act. The Act designated the Iowa Department of Public Health (IDPH) as the lead agency for system development and implementation, and established the Trauma System Advisory Council (TSAC) to advise the department and to evaluate system effectiveness. The legislation also established the State Trauma Registry (STR) for statewide injury-reporting as a reportable condition. Implementation began in January of 1997 with the categorization and verification of all hospitals as trauma care facilities based on availability of resources. Statewide transport protocols were developed for all transporting ambulance services. Emergency medical technicians, nurses and physicians were required to obtain specialized trauma education. On January 1, 2001 the Iowa Trauma System became fully operational. Hospitals in Iowa were reviewed, verified and categorized, and had at least one physician with Advanced Trauma Life Support (ATLS) training. The committee structure for oversight and evaluation was established and the State Trauma Registry was in place. The all-inclusive system required the participation of Iowa hospitals, transporting ambulance services, and rehabilitation centers.

The continuing goal of the trauma system is to provide timely, specialized care by matching trauma patient needs to appropriate resources, from the time of injury through rehabilitation. This requires cooperation of trauma care providers and resources throughout the state along each phase of trauma care. A systems approach recognizes this continuum of care and has been shown to reduce overall costs, disability, and death associated with traumatic injury. To accelerate the progress in reducing injuries, the three injury control components of prevention, acute care, and rehabilitation must work together.

State Trauma Registry

Chapter 136:641 of the Iowa Code established the State Trauma Registry in 1996. The Code established trauma as a reportable condition with a "trauma patient" defined as a victim of an external cause of injury that results in major or minor tissue damage or destruction caused by intentional or unintentional exposure to thermal, mechanical, electrical or chemical energy, or by the absence of heat or oxygen (ICD9 Codes E800.0 - E999.9). The State Trauma Registry is the data repository operated by the Iowa Department of Public Health Bureaus of Emergency Medical Service and Health Statistics in collaboration with the University of Iowa Injury Prevention Research Center. The Registry collects and analyzes reportable patient data on the incidence, severity, and causes of trauma, including the central registry for brain and spinal cord injuries (IAC 641—21.1(135)) and farm-related injuries. The Iowa Trauma Patient Data Dictionary specifies the inclusion criteria and reportable patient data to be reported to the trauma registry or reported to a trauma care facility. The State Trauma Registry also includes data in the Iowa EMS Patient Registry reported by EMS units in Iowa with specifications of the inclusion criteria and reportable patient data in the Iowa EMS Patient Registry Data Dictionary. Data also utilized include the Hospital Discharge Data and the Death Certificate Data from Iowa.

The use of the data include an annual report of the magnitude of injuries in Iowa, the organization of trauma care, the performance of care and outcomes. The Trauma System Advisory Council's System Evaluation and Quality Improvement Subcommittee routinely review

the data for system improvement recommendations. The data has been used for the Burden of Injury Report and injury prevention and control research.

Trauma System Advisory Council

The Trauma System Advisory Council (TSAC) serves in a leadership role to develop and support the trauma system. The committee provides recommendations to the Iowa Department of Public Health (IDPH) to implement improvements in the trauma system. TSAC has partitioned system improvement into six sub-committees:

- Data Management Sub-committee,
- Prevention and Outreach Sub-committee,
- System Development Sub-committee,
- System Evaluation and Quality Improvement Sub-committee,
- Triage and Transport Sub-committee,
- Verifications Sub-committee.

Magnitude of Trauma

In 2014, injuries accounted for 2,183 total deaths in Iowa with 2,046 Iowa residents and 28,218 hospitalizations. EMS services were provided in 20,316 EMS trauma incidents with 14,657 transported to health care facilities.

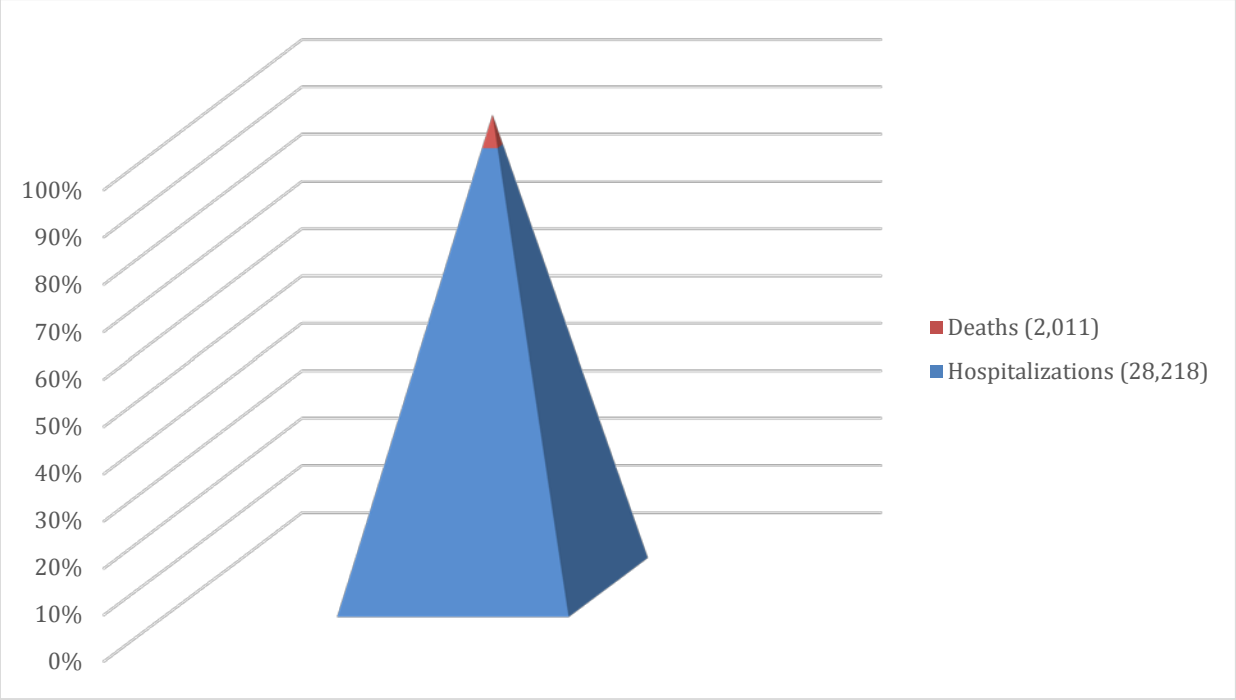


Figure 1: First hospital admissions and deaths in 2014

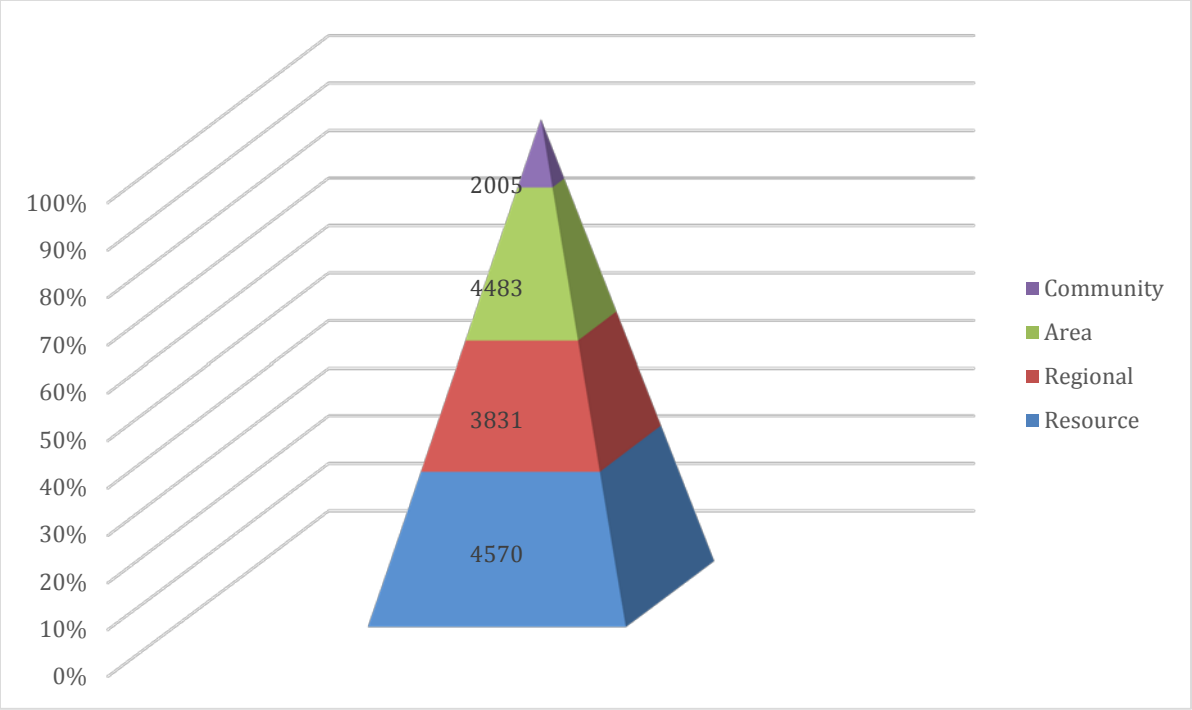


Figure 2: State Trauma Registry Patients in 2014

Data was collected by hospitals participating (54.2%) in the State Trauma Registry including 14,889 patients (52.8% of admissions).

Deaths

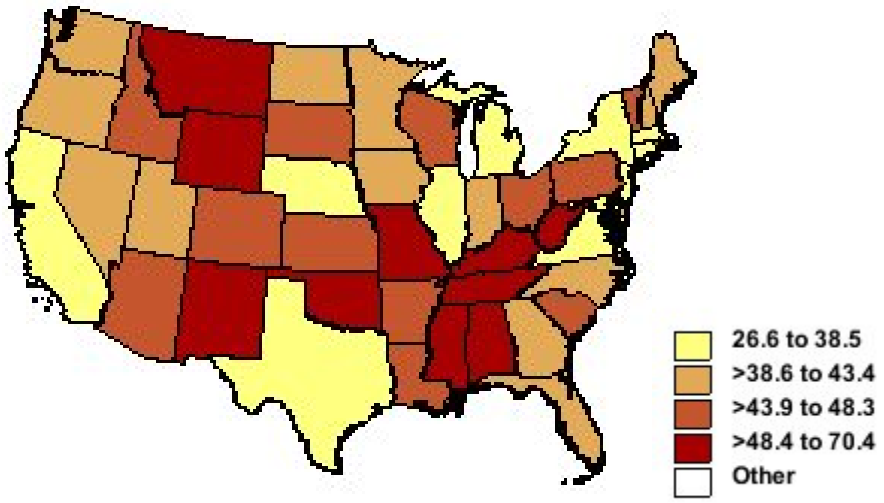


Figure 3: Age-adjusted U.S. death rates (CDC), 2010-2014

In comparison to other states, Iowa is in the second to lowest of the four tiers of injury mortality and lower to other rural states. This can be attributed to the causes of injury and response to injury through the trauma system.

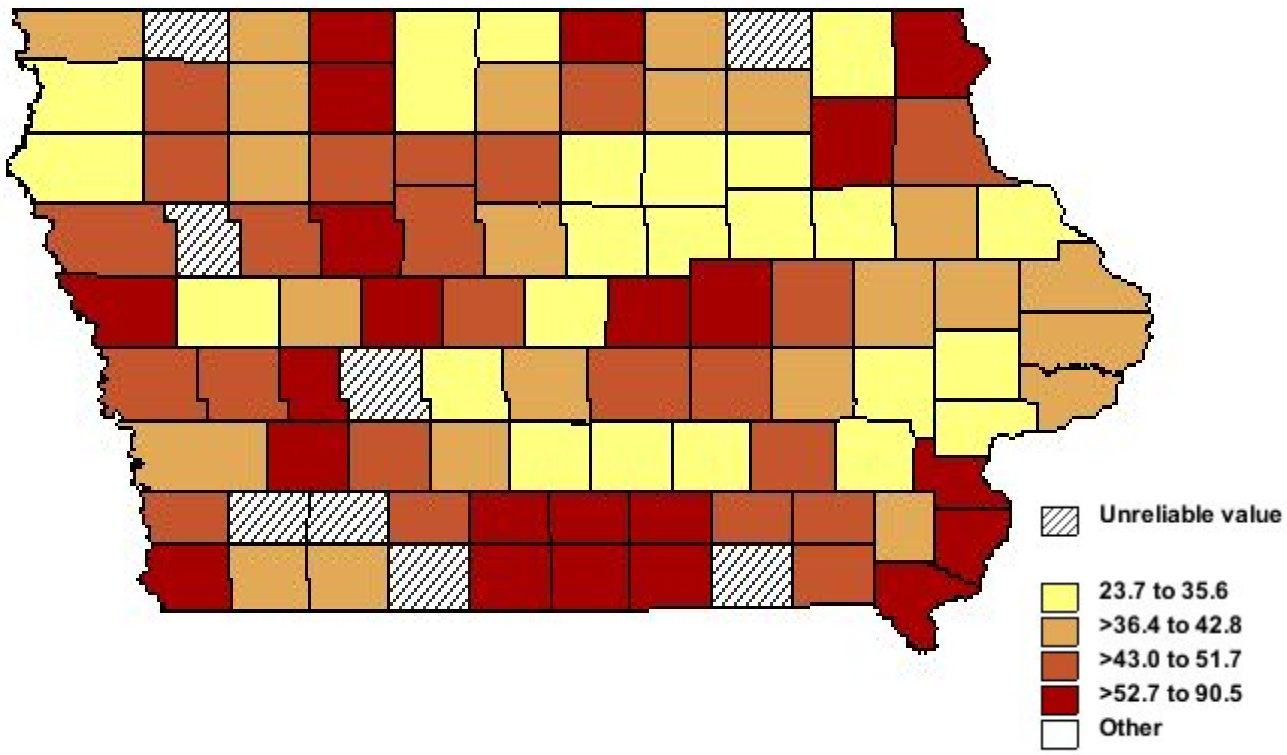


Figure 4: County age-adjusted death rates in Iowa (CDC), 2010-2014

Within Iowa, there exists considerable variation in injury mortality across the counties. The highest age-adjusted rates were observed in rural counties.

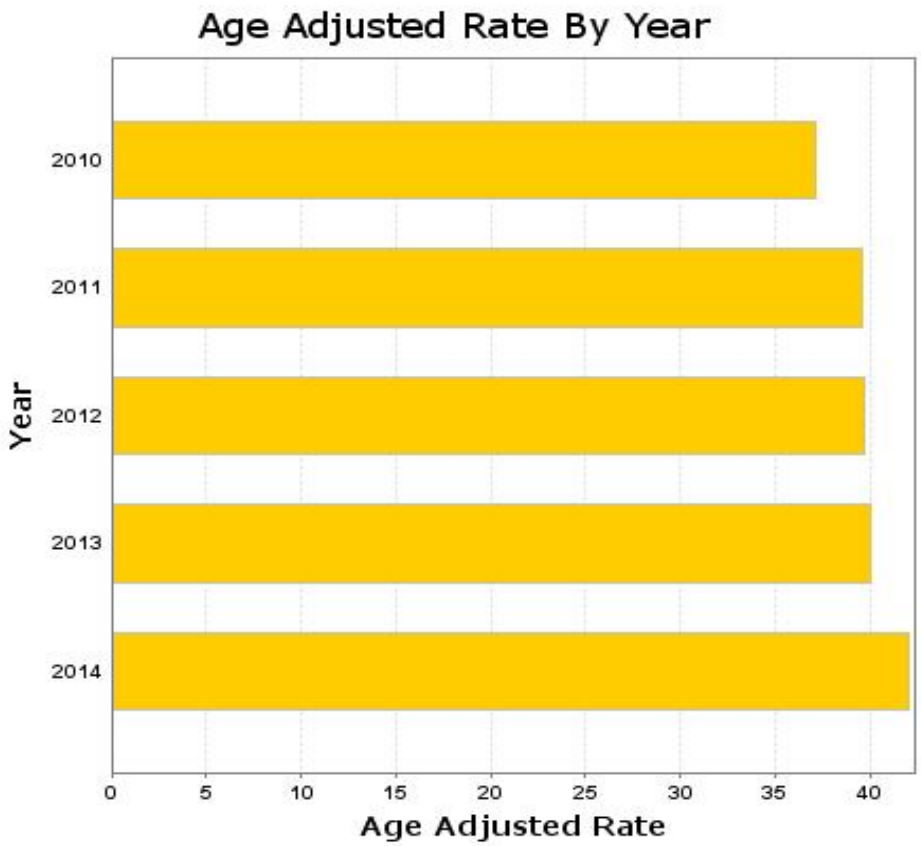


Figure 5: Age-adjusted mortality rates 2010-2014 in Iowa

The number of deaths and the age-adjusted mortality rates have increased over time in Iowa with the number of deaths exceeding 2,000 persons in 2014.

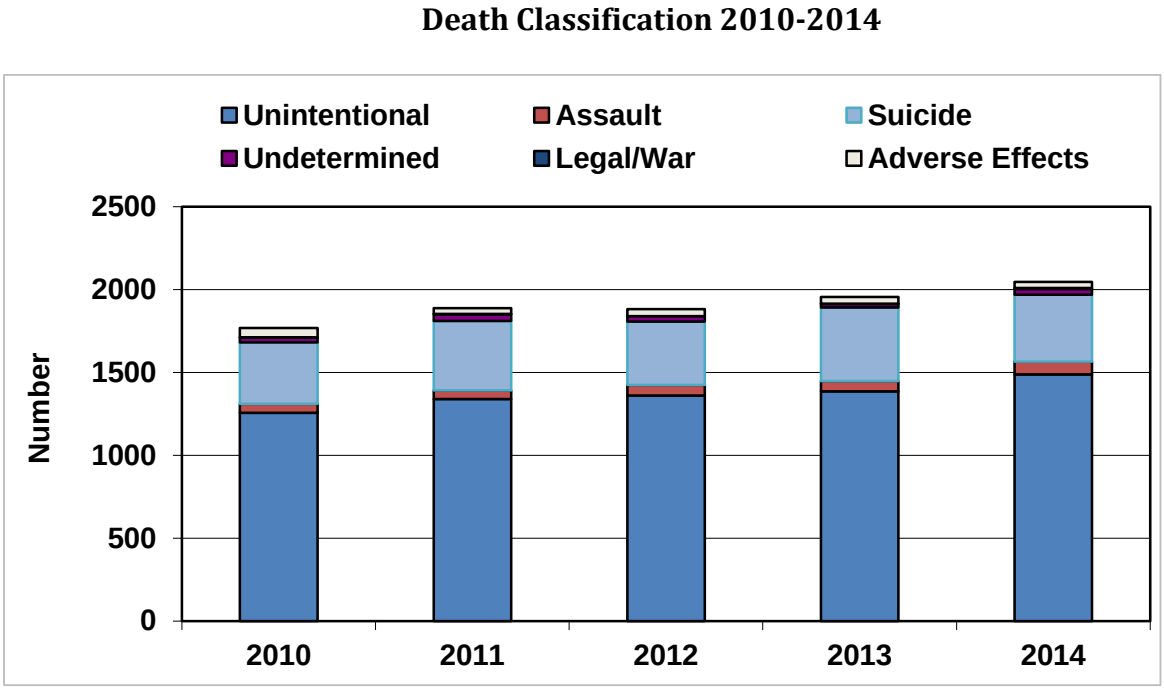


Figure 6: Deaths, 2010-2014 Death Certificate Data

The trend in the overall number of deaths has gradually increased. There were 1,769 deaths in 2010 and 2,046 deaths in 2014. In 2014, the etiology of deaths were 73% unintentional, 20% suicide, 4% from assault, 2% from adverse effects, 0.3% from legal/war related events, and 18% from undetermined events.

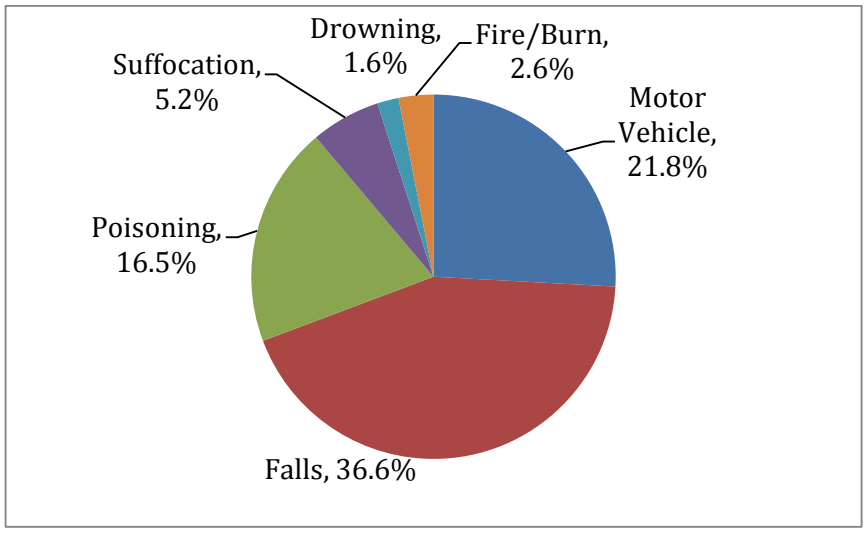


Figure 7: Unintentional injury deaths (2014 Death Certificate Data)

The largest number and percentage of unintentional injury-related deaths were a result of falls (36.6%). The second largest contributor to unintentional injury-related deaths was motor vehicle crashes (21.8%), followed by poisoning (16.5%) and suffocation (5.2%). Fire/burn and drowning accounted for 2.6% and 1.6% of unintentional injury-related deaths respectively.

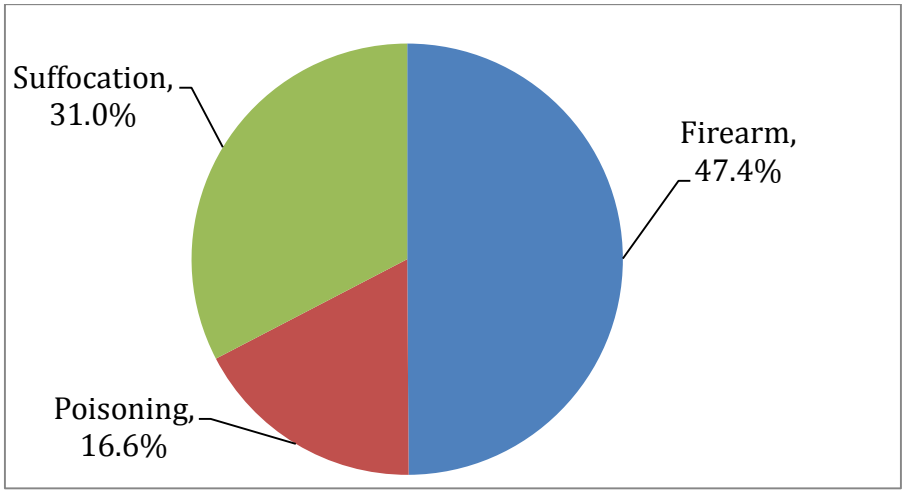


Figure 8: Deaths from Suicides (2014 Death Certificate Data)

Of suicides, firearms were the leading cause of death (47.4%), followed by suffocation at 31% and poisoning at 16.6%.

Cause	Number (2014)	5 Year Average
Drowning	24	32
Fall	545	450
Fire/Flame	38	32
MV Traffic	324	347
Poisoning	246	209
Suffocation	78	65

Table 1: Cause of Death, Observed 2014 compared to prior 5 year average

The causes of injury producing death has changed. There have been decreases in deaths observed in drowning and motor vehicle traffic injuries. However, they were counterbalanced by increases in deaths from falls, burns, poisonings, and suffocation. Based upon a prior 5-year average, 95 more deaths were from falls, 37 from poisoning, 13 from suffocation, and 6 from burns.

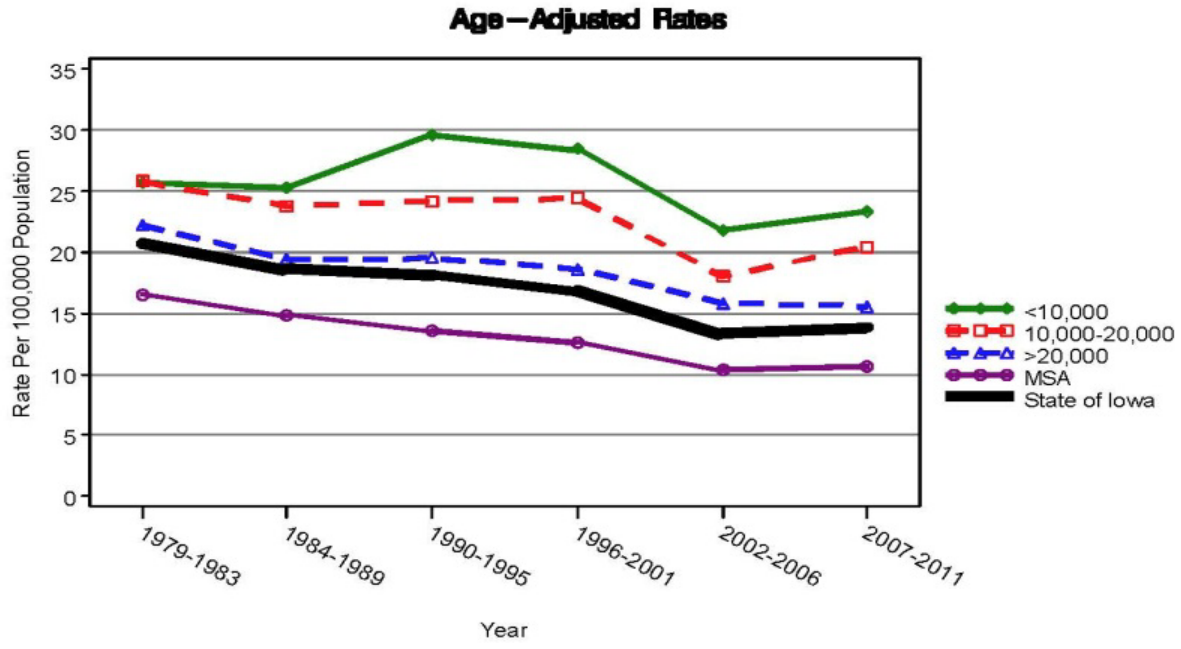


Figure 9: Trend in transportation deaths by county size, 1979-2011

Though declining the disparity if fatalities from motor vehicle crashes by county size is evident and appears to be greater between counties <10,000 persons to those large counties (MSAs). (Iowa Health Factbook, 2013)

Hospitalizations

Injury-related trauma occurred in 28,218 hospitalized patients, and 17,137 overall patients and 15,952 Iowans using the definition for injury surveillance (CDC/CSTE/Safe States, 2012). Fifty-four percent of hospitalized patients were women.

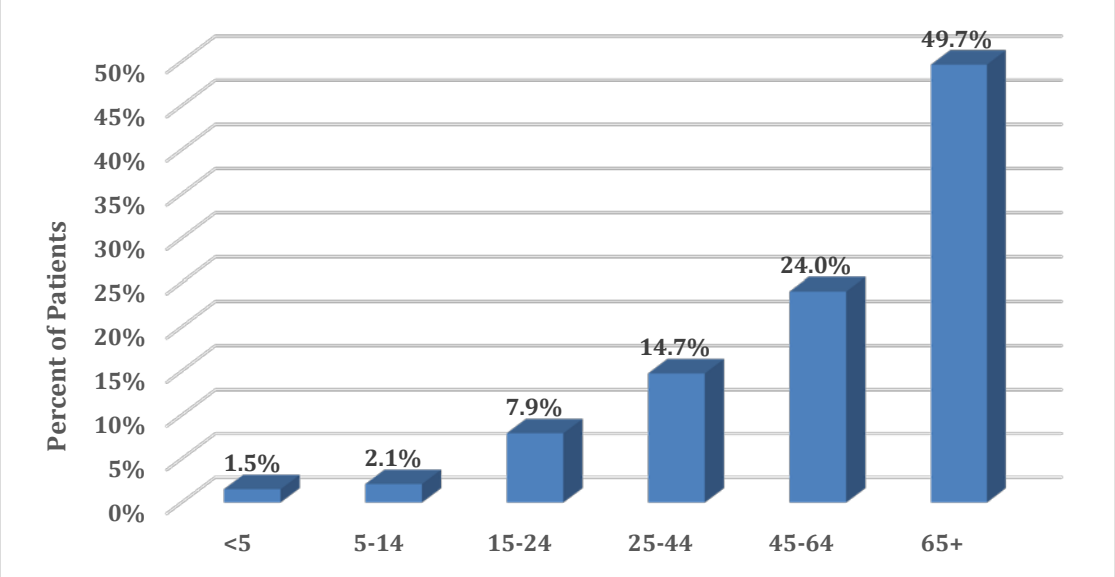


Figure 10: Age distribution of trauma admissions (2014 Hospital Discharge Data)

Nearly half of the admissions were in patients 65 years and older. Less than 12% of trauma-related hospitalizations were in patients under 25 years old.

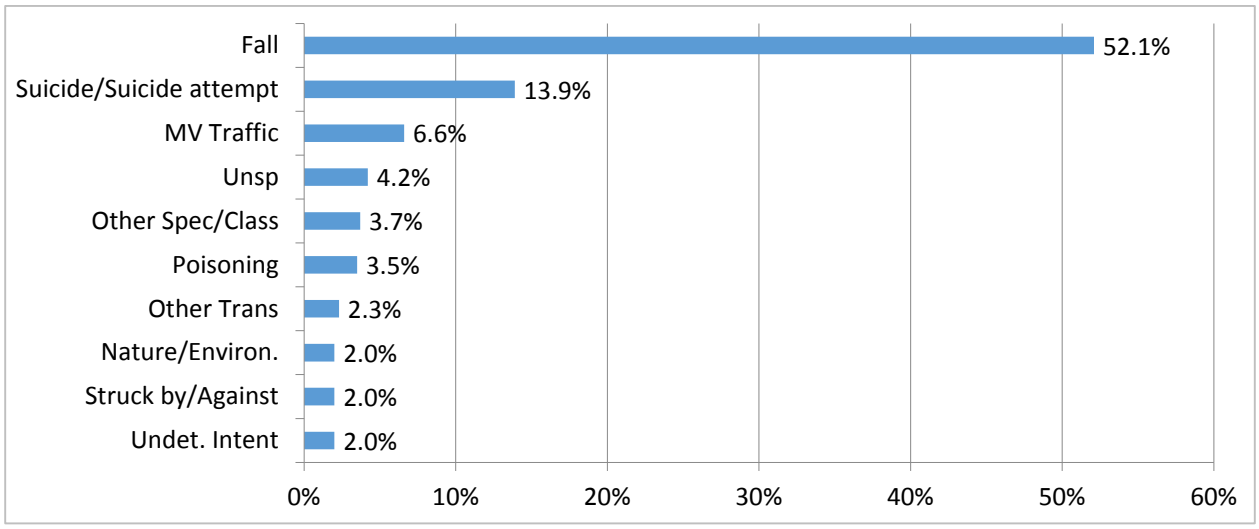


Figure 11: Mechanism of injury (2014 Hospital Discharge Data)

The leading cause of hospitalizations was from falls (52.1%). This was followed by suicides, motor vehicle crashes, poisonings, and then other etiologies. Of the suicides, 82.4% were due to poisoning overdoses. Of the assaults, 34.3% were due to struck by/against injury mechanisms.

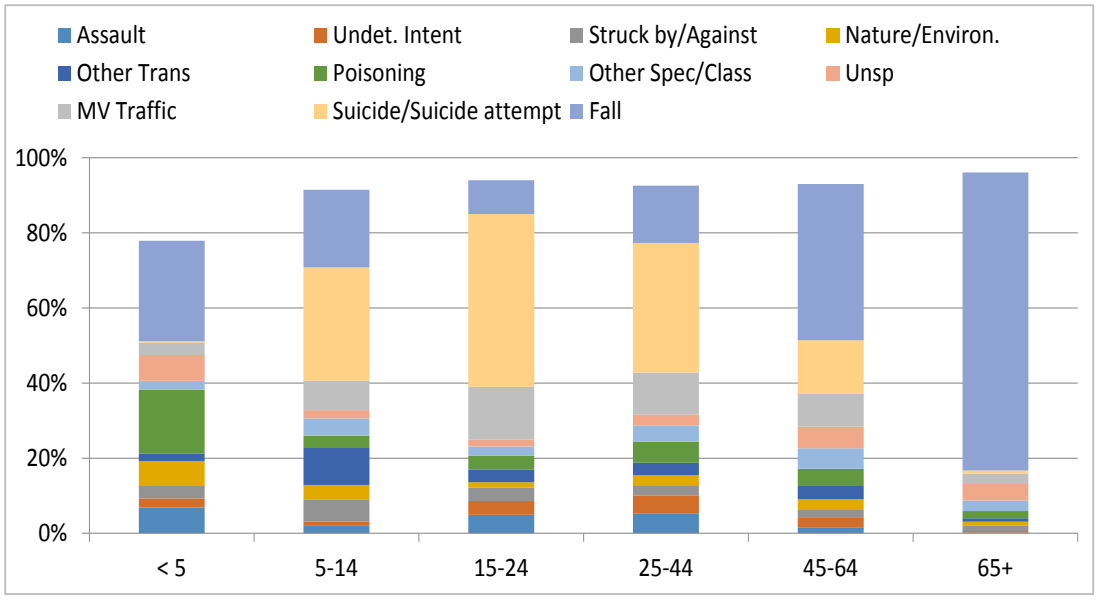


Figure 12: Age distribution of mechanism of injury (2014 Hospital Discharge Data)

The mechanism of hospitalized injuries varied by age, but falls was the major cause of injury in the very young and those aged 45 and over. Suicide/Suicide attempts and motor vehicle crashes were major etiologies in those aged 15-44 years. The majority of suicide/suicide attempts were due to poisoning overdoses.

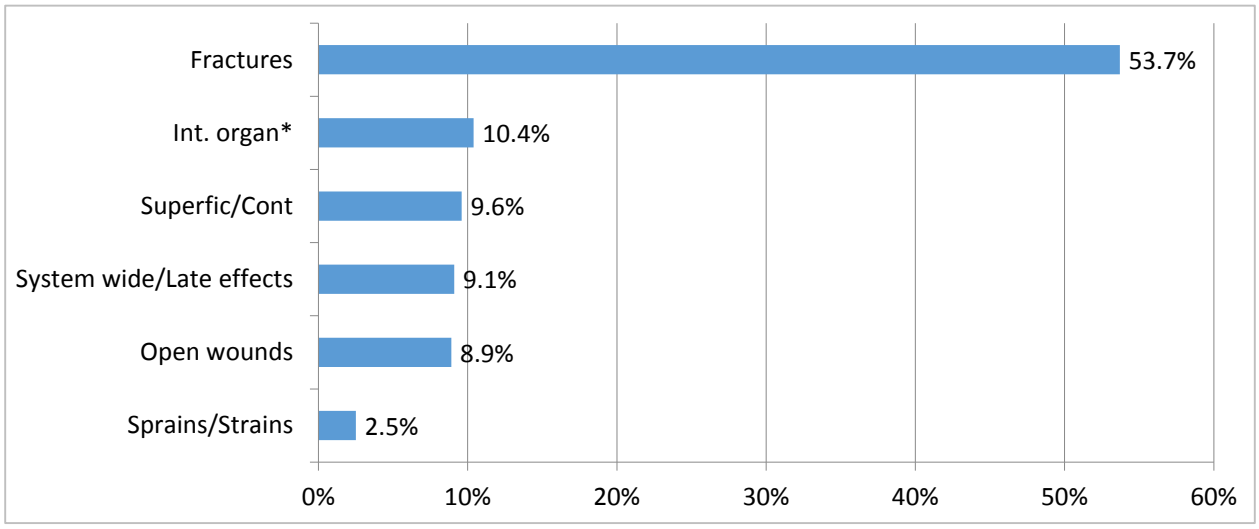


Figure 13: Primary injury type (2014 Hospital Discharge Data)

The major primary injury type (using the Barell Injury Diagnosis Matrix classification) that the trauma system encountered was fractures (53.7%) followed by internal organ injuries (10.4%), superficial contusions (9.6%), open wounds (8.9%), and sprains/strains (2.5%). Late effects of injuries accounted for 9.1%. Of the internal organ injuries, 61.3% were traumatic brain injuries.

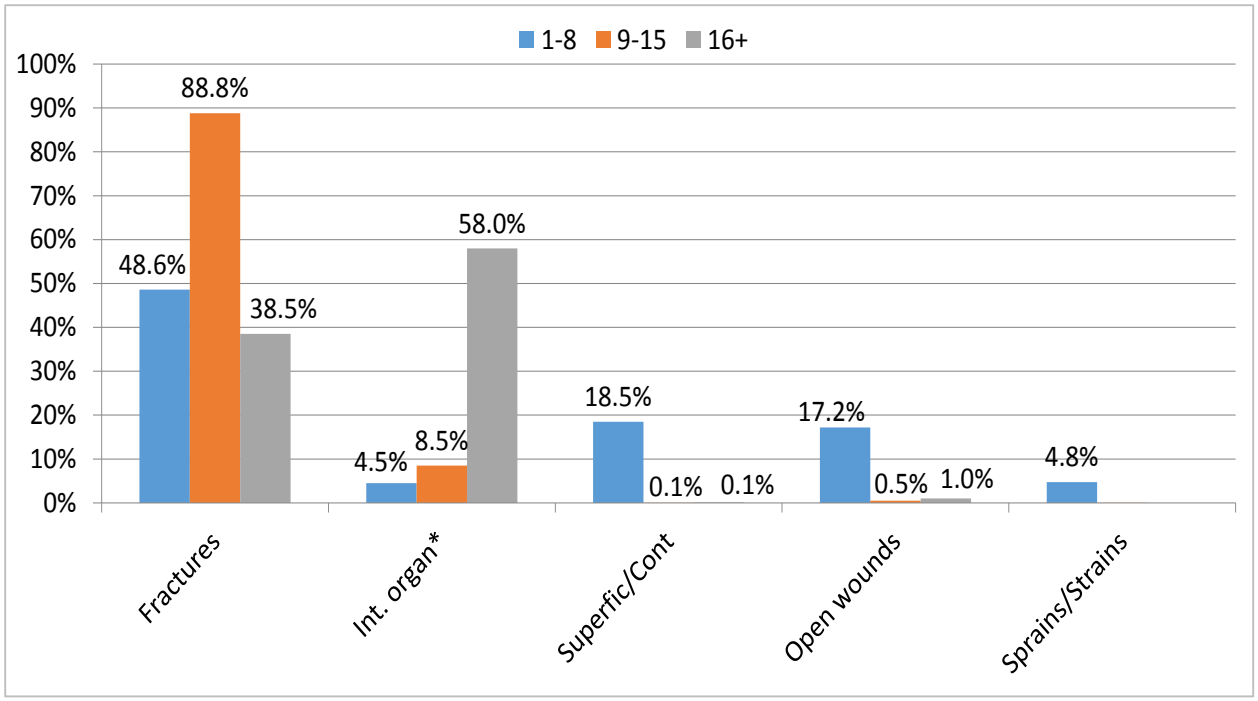


Figure 14: Primary injury type within injury severity score (2014 Hospital Discharge Data)

The Injury Severity Score has been categorized as 1-8=mild, 9-15=moderate, and 16 or higher=severe. The most severe injuries are head injuries, followed by fractures.

Trauma System Infrastructure

Emergency Medical Services

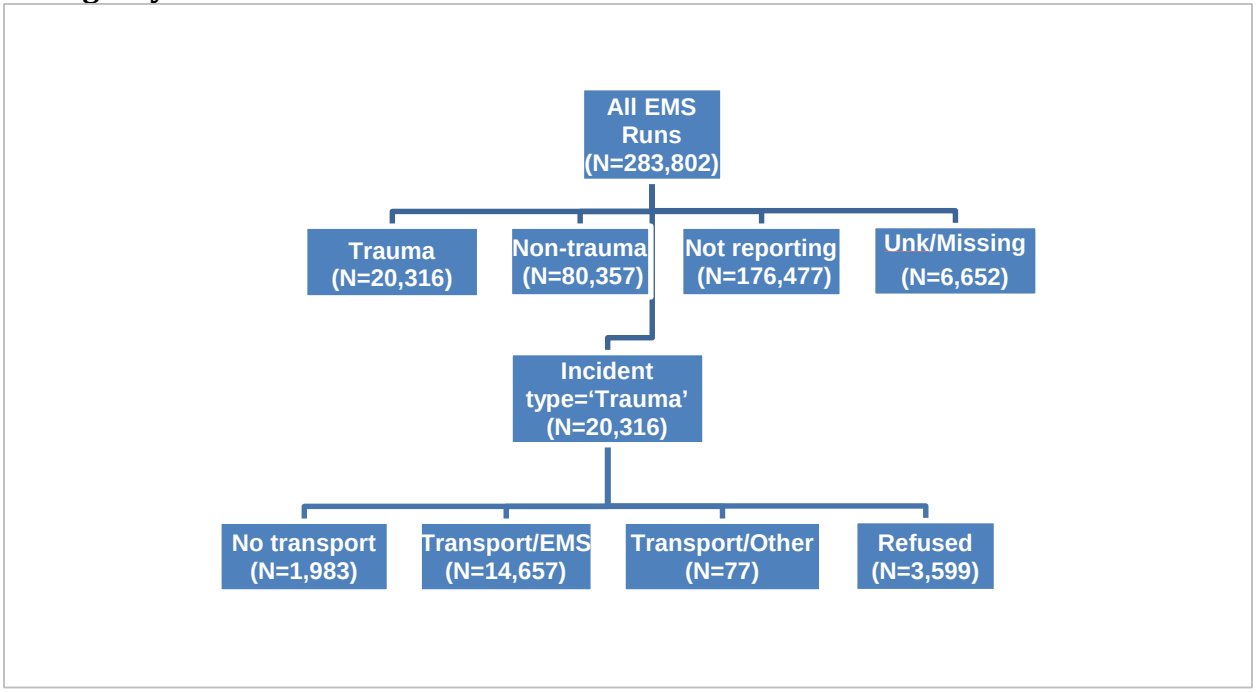


Figure 15: EMS runs in 2014 (2014 EMS Database)

There were 283,802 EMS calls reported in 2014. Of those 20,316 were trauma-related events. Of those, 14,657 were are transported by EMS. No transport was required in 1,983, 3,599 refused and 77 were transported by other means.

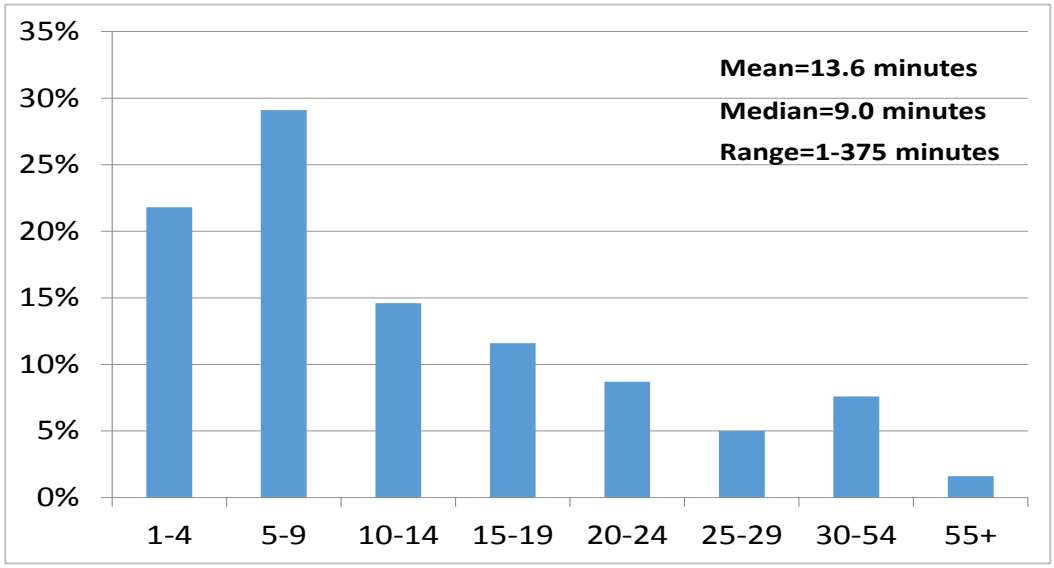


Figure 16: Scene to hospital transport times (2014 EMS Database)

The average transport time in Iowa for trauma-related incidents (911 calls only and treated/transferred by EMS only) was 13.6 minutes and a median time of 9.0 minutes with the majority of patients below 10 minutes. Long transport times of 30 minutes or greater were shown in 9.2% of runs.

Trauma Hospitals

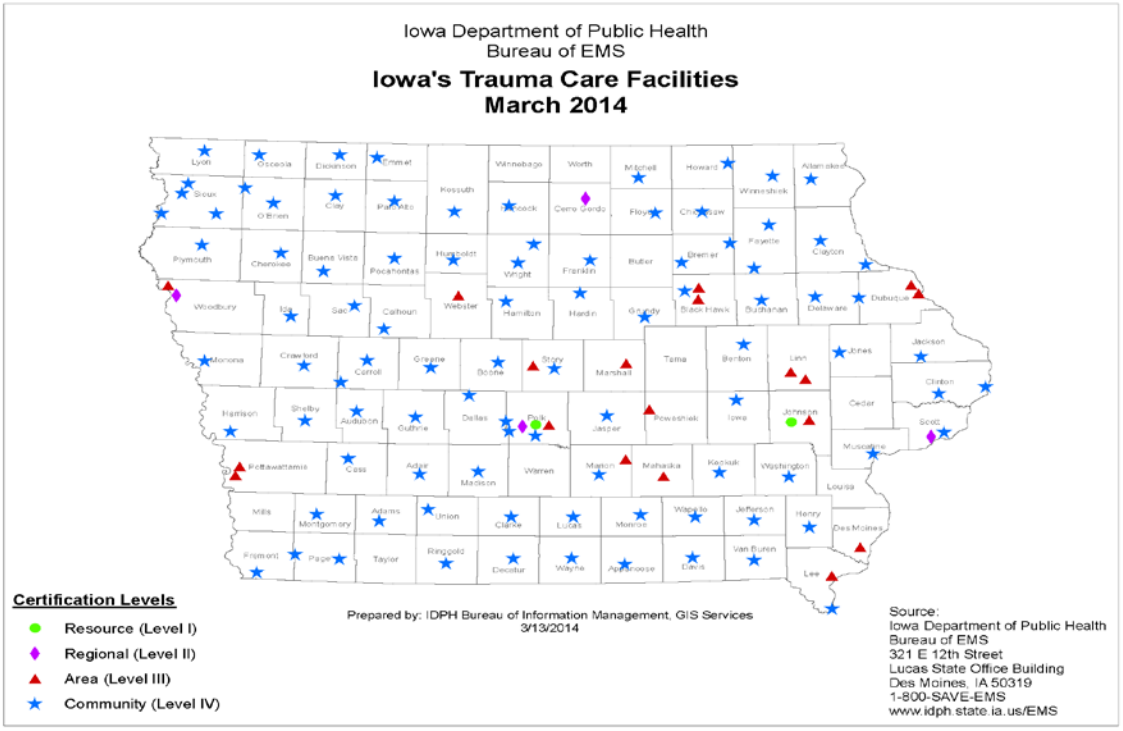


Figure 17: Location of the trauma system care facilities by level of hospital capability in 2014.

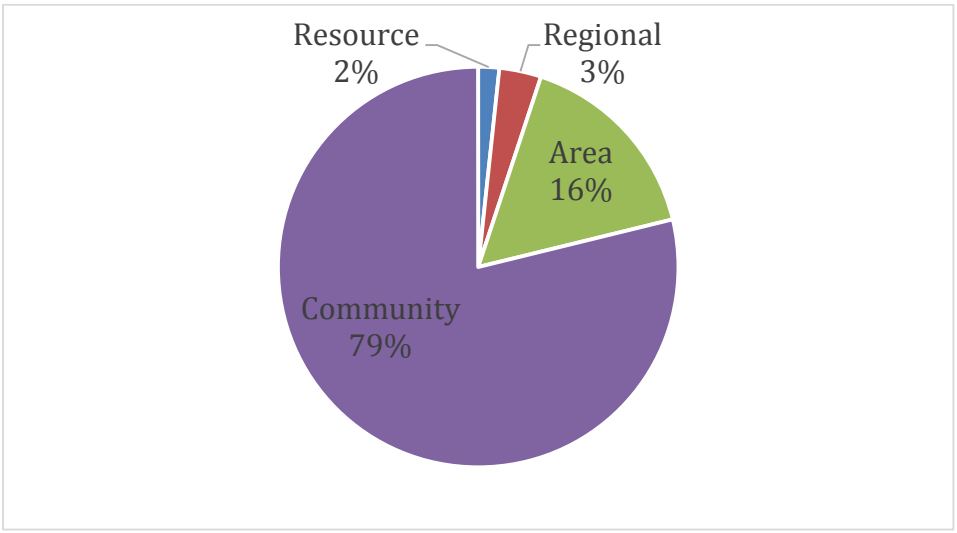


Figure 18: Distribution of trauma hospitals by level (2014 State Trauma Registry/STR Data)

In Iowa, the majority of hospitals are level IV and have minimal capacity for trauma care with limited specialty coverage. Twenty-one percent of hospitals have surgical coverage, and 5% also have specialty care. Because of the large number of hospitals with minimal capabilities for trauma care, a system of care based on triage and transfer is necessary for urgent care of trauma victims.

State Trauma Registry Hospitals
A total of 14,889 patients were entered in to the State Trauma Registry.

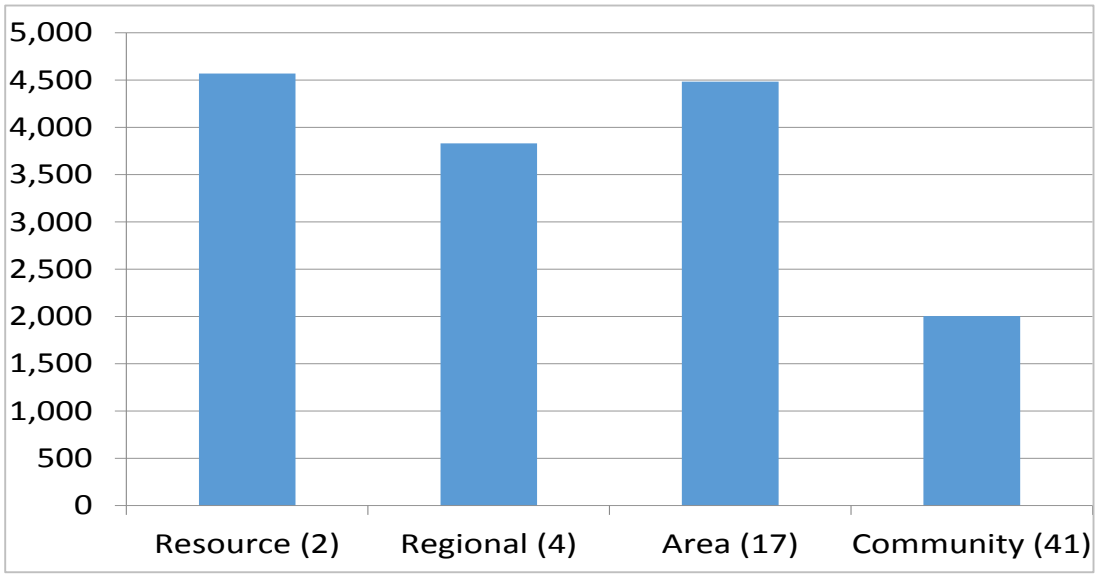


Figure 19: Number of patients at each trauma hospital level (2014 STR Data)

Complete reporting was done by Resource and Regional Hospitals and 90% of Area hospitals.

Response to Trauma

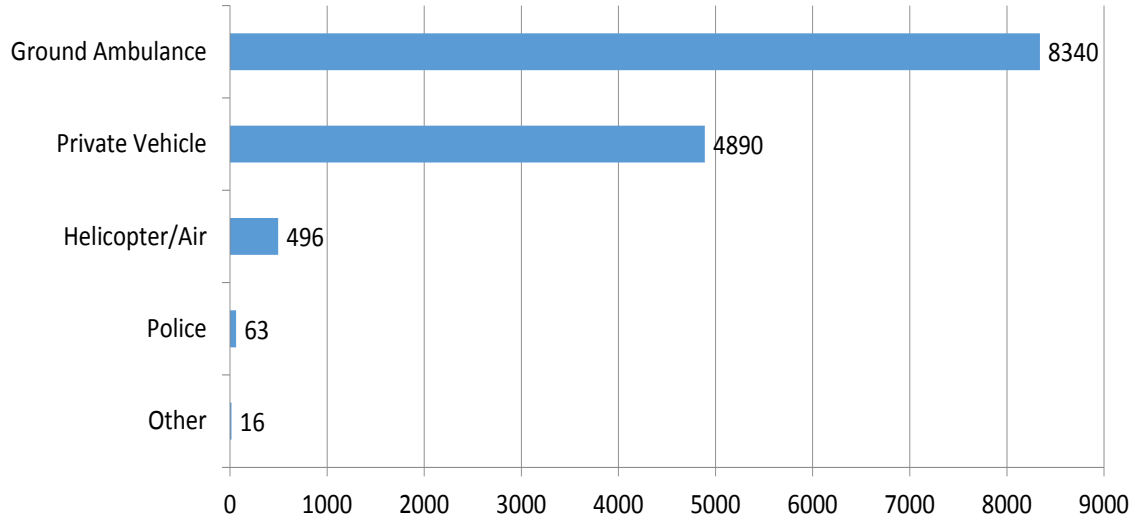


Figure 20: Arrival mode to trauma registry hospitals (2014 STR Data)

Of the arrivals at the emergency department of the trauma registry hospitals, 60% were received by ground ambulance, 3.6% by helicopter, 35.4% by private vehicle and 0.1% by other means.

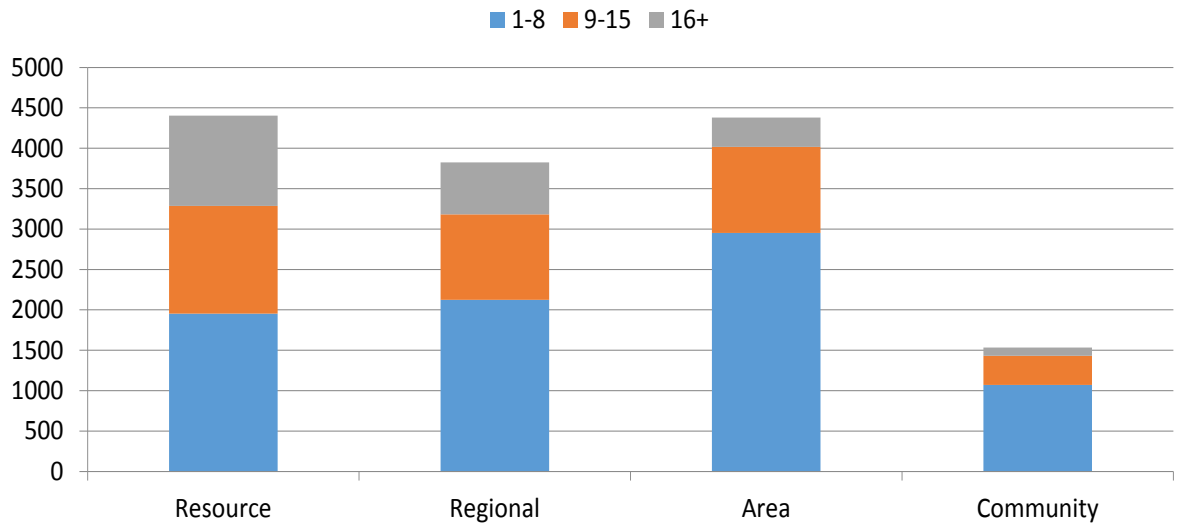


Figure 21: Number of patients by injury severity score and trauma hospital level (2014 STR Data)

More severely injured patients were treated at the Resource and Regional hospitals. Resource hospitals had 56% with ISS>8, Regional hospitals had 44%, Area had 33%, and Community had 30%.

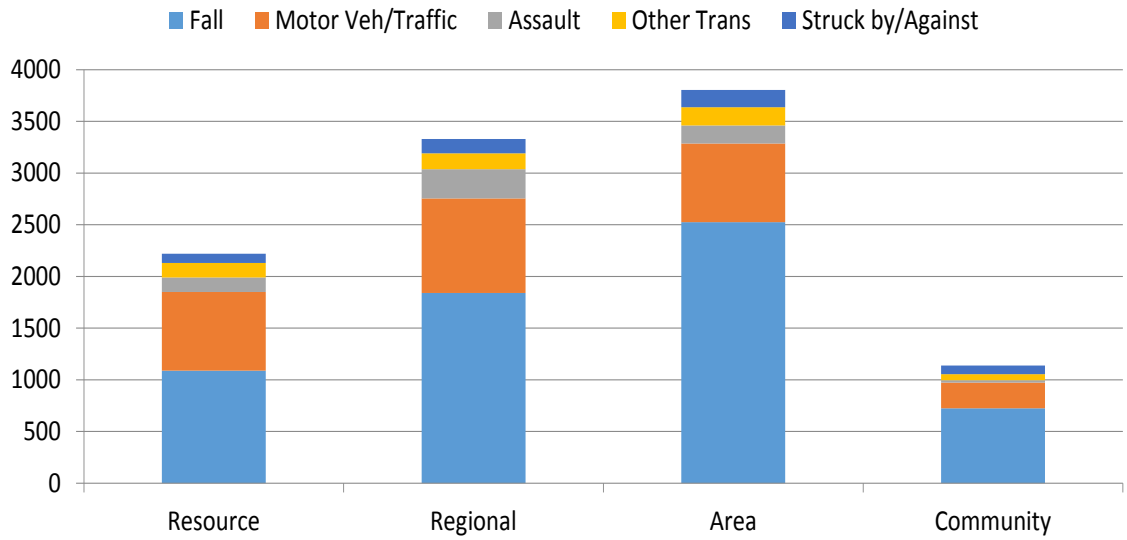


Figure 22: Number of patients by mechanism and trauma hospital level (2014 STR Data)

The majority of the treatment for motor vehicle crashes is at the Resource and Regional hospitals. Falls are more frequently seen at Area hospitals. Falls represent the majority of patients at Area and Community hospitals.

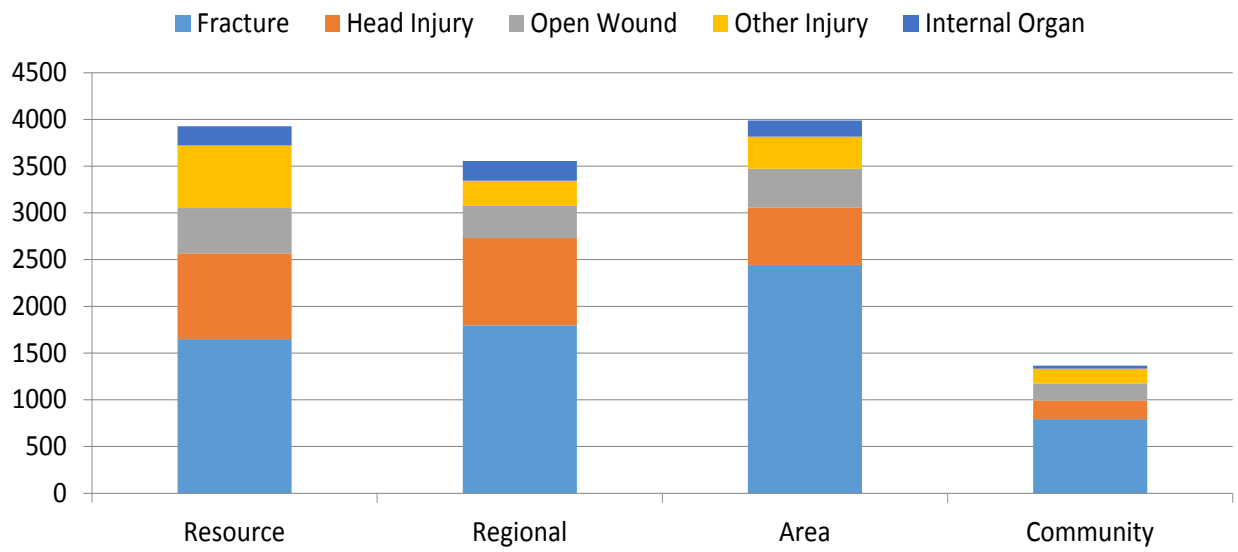


Figure 23: Percent of patients by primary nature of injury and trauma hospital level (2014 STR Data)

Nearly 50% of the patients at Area and Community hospitals are admitted with fractures. Seventy percent of head injuries are treated at the Resource and Regional hospitals.

Performance indicators

EMS Performance Indicators

Indicator	Number	%
Cardiac arrest during transport	**13**	**0.7**
Died at scene*	**91**	**4.2**
Transport time 30+ minutes	**210**	**10.8**
Scene time 10+ minutes	**1646**	**84.4**
Scene time 20+ minutes	**539**	**27.6**
Access time to patient 10+ minutes	**18**	**1.4**
Access time to patient 20+ minutes	**4**	**0.3**
Treatment time 10+ minutes	**1511**	**78.9**
Treatment time 20+ minutes	**432**	**22.6**
Time from dispatch >20 minutes	**109**	**5.6**
Transport time 30+ minutes (ground ambulance only)	**204**	**11.0**

Table 2: State performance indicators for EMS (2014 EMS Data; Trauma-related incident types and SEQIS population)
Note: SEQIS population = abnormal vitals and/or met anatomic criteria, n=2,836
All indicators were also based on '911 transports only' and 'treated/transported by EMS', n=1,960
*'Died at scene' were also based on SEQIS population and '911 transports only', n=2,150

Performance indicators showed that there are a low number of cardiac arrests during transport. Transport times of less than 30 minutes of 89% suggests that units are transporting to local hospitals. The scene time remains high and above the desired 10 minutes in the majority of encounters, which is a reflection of treatment times in excess of 10 minutes in 79% of cases.

Resource and Regional Hospitals

Description	2010-2014 %	2014 %
Trauma surgeon present in ED w/in 5 mins of pt arrival	72.5	74.1
Trauma surgeon present in ED w/in 15 mins of pt arrival	82.1	86.0
Trauma surgeon present in ED w/in 20 mins of pt arrival	84.1	88.0
Trauma surgeon response time unknown	6.7	4.9
1st physician present in ED w/in 5 mins of pt arrival	79.9	77.9
1st physician present in ED w/in 20 mins of pt arrival	92.8	93.4
Physician response time unknown	8.1	5.7
Trauma pt had a calculated Ps score	89.4	87.4
Deceased trauma pt was autopsied	41.4	43.8
Safety equipment was documented	94.5	95.1
Safety equipment not used	39.1	35.1
Blood ETOH was measured	86.2	84.6
Blood ETOH was positive	30.8	26.6
1st hospital initial GCS <8 w/no head CT done before transfer to definitive care	53.6	48.8
1st hospital initial GCS <8 arrived to definitive care >=4 hrs	20.2	13.5
Survival rate		
High risk	47.4	49.6
Moderate risk	91.7	90.1
Low risk	98.9	98.7

Table 3: State performance indicators for resource and regional hospitals, 5 year and 2014 rate (SEQIS population = Met full alert response or met physiologic and/or anatomic criteria) The denominator is based upon eligibility for each indicator.

The state performance indicators show that the proportions (5) have improved but not substantially over the last five years. Trauma surgeon response times, unknown trauma surgeon and physician response times, autopsy performance, no head CT done before transfer, and delays in transfer of traumatic brain injury patients showed improvement. On prevention indicators, safety equipment use and alcohol use also showed improvement.

Area Hospitals

Description	2010-2014 Rate	2014 Rate
Trauma surgeon present in ED w/in 5 mins of pt arrival	31.1	30.8
Trauma surgeon present in ED w/in 20 mins of pt arrival	53.8	61.5
Trauma surgeon present in ED w/in 30 mins of pt arrival	62.4	70.6
Trauma surgeon response time unknown	19.3	23.1
1st physician present in ED w/in 5 mins of pt arrival	56.0	62.2
1st physician present in ED w/in 20 mins of pt arrival	83.2	86.2
Physician response time unknown	5.2	5.5
Trauma pt had a calculated Ps score	80.4	83.5
Deceased trauma pt was autopsied	47.7	51.3
Safety equipment was documented	92.8	92.7
Safety equipment not used	30.7	23.9
Blood ETOH was measured	56.7	64.2
Blood ETOH was positive	39.3	36.8
Survival rate		
High risk	39.6	43.3
Moderate risk	88.7	85.5
Low risk	98.2	97.6

Table 4: State performance indicators for area hospitals, 5 year and 2014 rate (SEQIS population = Met full alert response or met physiologic and/or anatomic criteria)

Indicators of response time by trauma surgeons and emergency room physicians show that Area hospitals have lower ability to respond. The ability to perform quality improvement by the probability of survival (Ps) has improved. Prevention of injuries through safety equipment use and reduced alcohol consumption is indicated. Patients with high risk for death do less well in Area hospitals, which may be an indicator of death before transfer to Resource or Regional Trauma Hospitals.

High Risk Injuries

Falls: Cause, Injury, Outcome

The magnitude and burden of unintentional falls is continuing to increase making it a major public health issue nationally and in Iowa. Unintentional falls are the leading cause of non-fatal injuries and third leading cause of unintentional injury-related death across all ages nationally (2014). In those aged 65+, falls are the leading cause of non-fatal injuries and injury death (2014). Iowa's burden from unintentional falls is similar to the U.S.; however, falls are the leading cause of non-fatal injury and injury-related death across all ages and in those aged 65 and over. Moreover, injury-related fall deaths in those aged 65+ in Iowa exceeded the national rate (97.1 vs. 58.5 per 100,000; 2014) making this age group a high risk population. Data from Iowa Hospital Discharge (inpatients) and Iowa Death Certificates were utilized for this assessment.

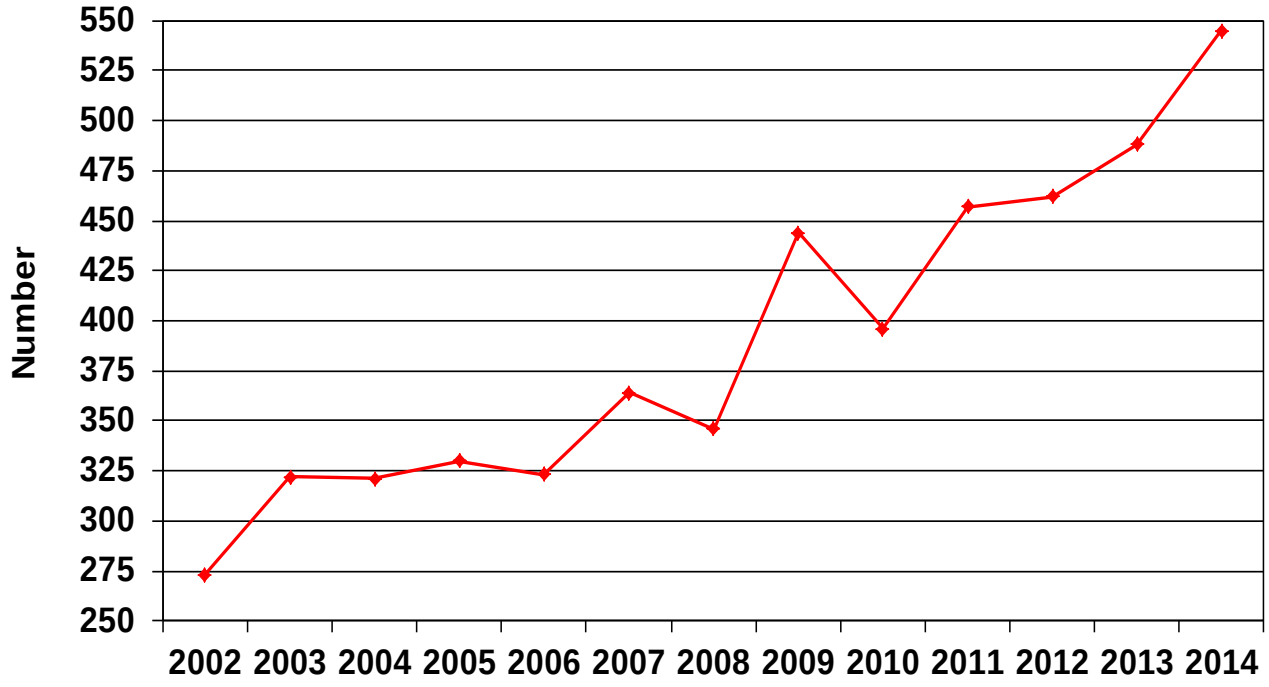


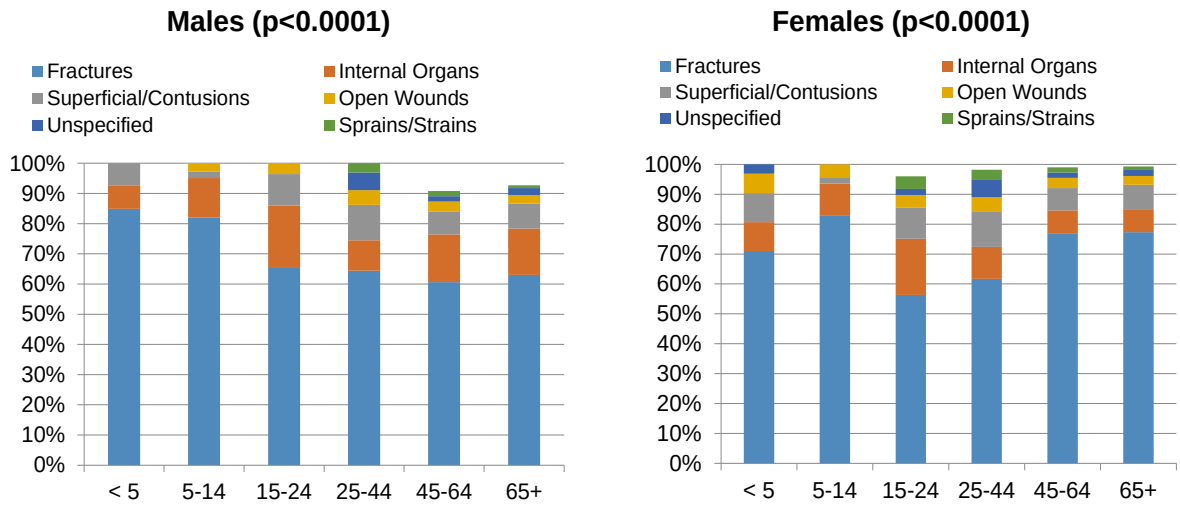
Figure 24: Number of Unintentional Fall Deaths, 2002-2014 (Death Certificate Data)

Deaths due to unintentional falls have increased 100% from 2002-2014 and now account for one fourth of the total injury mortality.

	Males					
	< 15	15-24	25-44	45-64	65+	Total
Type of fall	**N (%)**	**N (%)**	**N (%)**	**N (%)**	**N (%)**	**N (%)**
Different Level						
Stairs/Steps (880)	10 (8.2)	8 (6.4)	40 (12.0)	106 (9.0)	179 (5.8)	343 (7.1)
Ladders/Scaffolding (881)	0 (0.0)	8 (6.4)	19 (5.7)	90 (7.7)	84 (2.7)	201 (4.1)
Building/Other Structure (882)	2 (1.6)	6 (4.8)	17 (5.1)	20 (1.7)	7 (0.2)	52 (1.1)
Hole/Other Opening (883)	1 (0.8)	1 (0.8)	3 (0.9)	1 (0.1)	0 (0.0)	6 (0.1)
Other One Level to Another (884)	55 (45.2)	23 (18.4)	54 (16.2)	179 (15.3)	257 (8.4)	568 (11.9)
Total	68 (55.8)	46 (36.8)	133 (39.9)	396 (33.8)	527 (17.1)	1170 (24.3)
Same Level						
Slip/Trip/Stumble (885)	22 (18.0)	35 (28.0)	69 (20.7)	275 (23.4)	832 (27.2)	1233 (25.6)
Collide/Push/Shove (886)	9 (7.3)	3 (2.4)	1 (0.3)	3 (0.3)	3 (0.1)	19 (0.4)
Total	31 (25.3)	38 (30.4)	70 (21.0)	278 (23.7)	835 (27.3)	1252 (26.0)
Other/Unspecified (888)	23 (18.8)	41 (32.8)	130 (39.0)	502 (42.7)	1690 (55.4)	2386 (49.6)
Overall Total	122 (2.5)	125 (2.6)	333 (6.9)	1176 (24.5)	3052 (63.5)	4808
	Females					
Different Level						
Stairs/Steps (880)	7 (8.6)	11 (18.0)	45 (19.2)	148 (12.5)	339 (5.7)	550 (7.4)
Ladders/Scaffolding (881)	1 (1.2)	0 (0.0)	2 (0.9)	20 (1.7)	21 (0.4)	44 (0.6)
Building/Other Structure (882)	1 (1.2)	2 (3.3)	1 (0.4)	1 (0.1)	0 (0.0)	5 (0.1)
Hole/Other Opening (883)	0 (0.0)	1 (1.6)	1 (0.4)	2 (0.2)	3 (0.1)	7 (0.1)
Other One Level to Another (884)	46 (56.8)	4 (6.5)	15 (6.4)	92 (7.9)	469 (7.9)	626 (8.4)
Total	55 (67.8)	18 (29.4)	64 (27.3)	263 (22.4)	832 (14.1)	1232 (16.6)
Same Level						
Slip/Trip/Stumble (885)	11 (13.6)	22 (36.1)	76 (32.4)	394 (33.3)	1947 (32.7)	2450 (32.6)
Collide/Push/Shove (886)	1 (1.2)	3 (4.9)	1 (0.4)	2 (0.2)	7 (0.1)	14 (0.2)
Total	12 (14.8)	25 (41.0)	77 (32.8)	396 (33.5)	1954 (32.8)	2464 (32.8)
Other/Unspecified (888)	14 (17.3)	18 (29.5)	94 (40.0)	524 (44.3)	3173 (53.2)	3823 (50.8)
Overall Total	81 (1.1)	61 (0.8)	235 (3.1)	1183 (15.7)	5959 (79.3)	7519

Table 5. Fall level/type (mechanism) by age and gender (2014 Hospital Discharge Data).

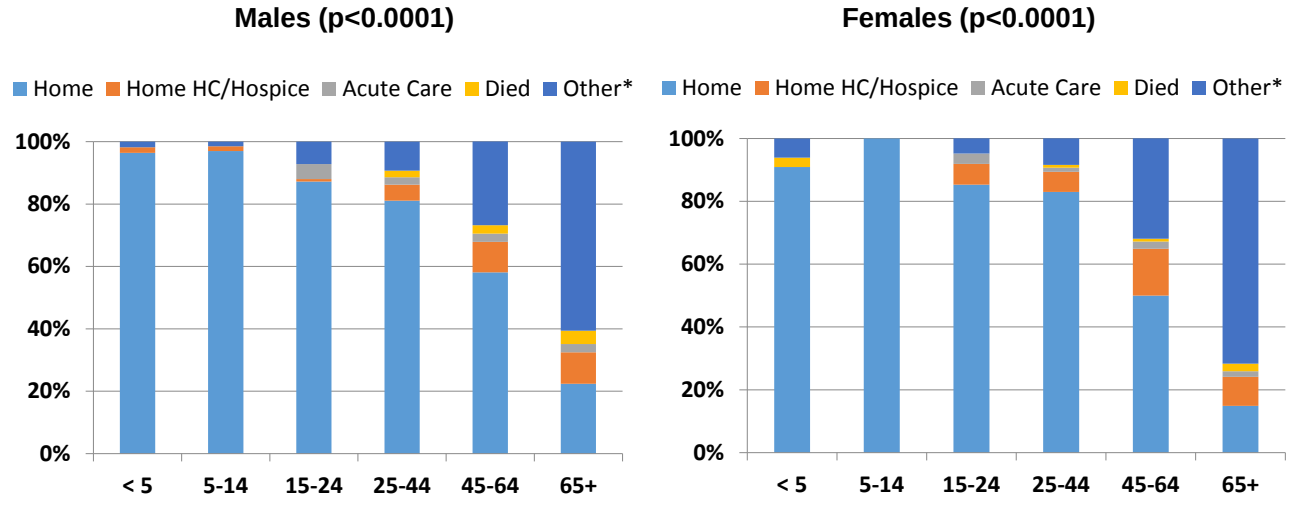
Overall, falls occur more frequently among those 65 years and older for both men (63.5%) and women (79.3%). Falls from different levels made up almost a quarter of all falls in men (24.3%), but only 16.6% of falls among females. Falls from different levels are most common for people less than 15 years of age (55.8% in men and 67.8% in women). Falls on a single or same level made up of more than a quarter of all falls in both genders, 26% in men and 32.8% in women. Falls on the same level are most common for both genders 15-24 years of age, 30.4% in men and 41% in women. Almost one half of all falls in men (49.6%) and women (50.8%) are other or unspecified types of falls. More than half of falls among the 65 and older are from other or unspecified types of falls, 55.4% in men and 53.2% in women.



Note: Figures represent only injuries > 2% of total injuries

Figure 25. Primary nature of injury by age and gender (2014 Hospital Discharge Data).

Fractures were the most common primary nature of injury in falls for all ages and in both genders. Hip fractures were most common type of fracture in both genders (especially in women) and particularly in those aged 65 and older. Internal organ injuries including traumatic brain injuries were more common in men and in those 15-25 years.



*** 'Other' is comprised of rehab, long-term care, and skilled nursing**

Figure 26. Hospital discharge disposition by age and gender (2014 Hospital Discharge Data).

For both genders, 80% or more of those age 44 and younger were discharged home. Among 45-64 year olds, about 60% of men and 50% of women were discharged home. Twenty-seven percent of men and 32% of women age 45-64 were discharged to rehabilitation, long-term care, or skilled nursing. Rehabilitation, long-term care, or skilled nursing was the most common discharge disposition for people age 65 or older, 61% of men and 72% of women. Only 15% of women 65 years or older were discharged home, while 22% of men of similar age were discharged home.

Poisonings: Cause, Injury, Outcome

The magnitude and burden of unintentional poisonings is continuing to linearly increase in Iowa similar to national trends.

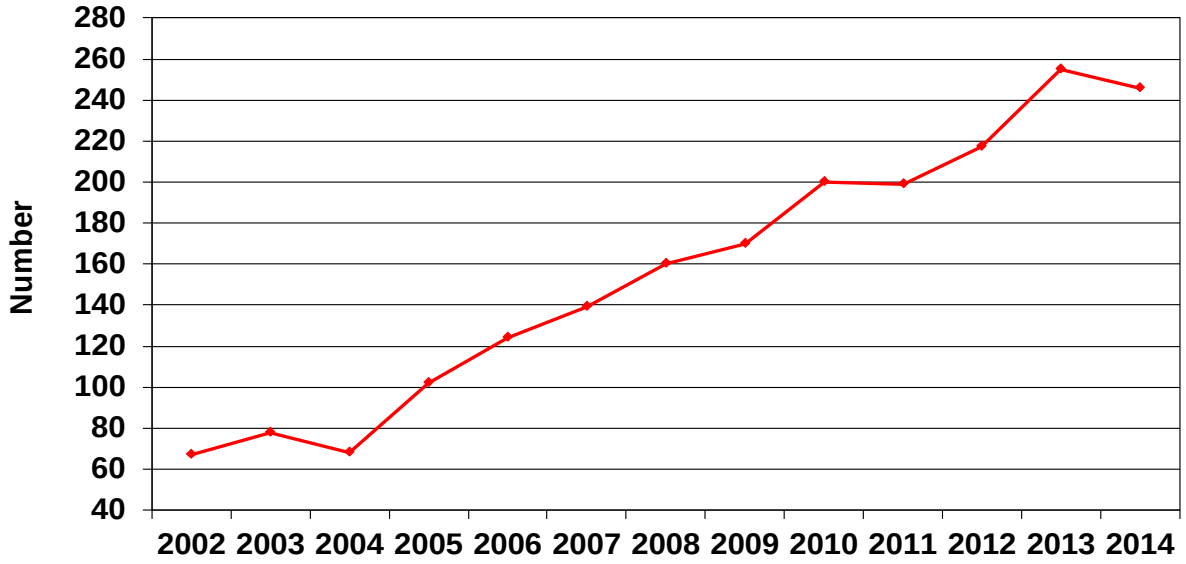


Figure 27: Number of Unintentional Poisoning Deaths, 2002-2014 (Death Certificate Data)

The number of deaths due to poisoning continues to increase with approximately 250 Iowans dying in 2013 and 2014.

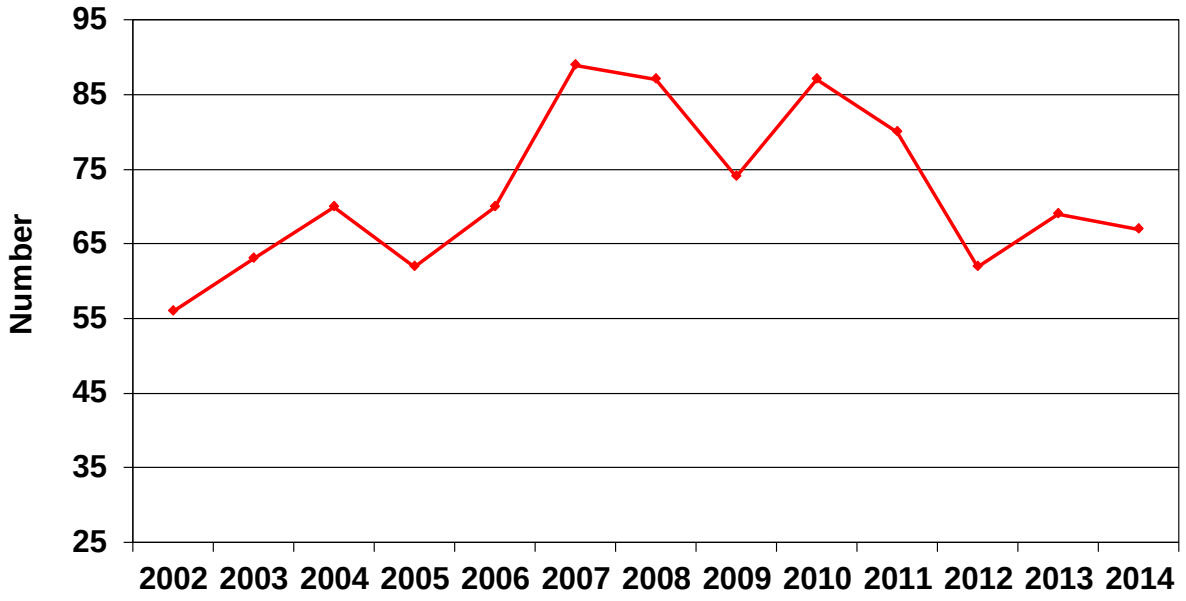


Figure 28: Number of Poisoning Deaths Due to Suicide, 2002-2014 (Death Certificate Data)

Suicidal deaths from poisoning has not increased similar to overall poisoning and has remained fairly constant.

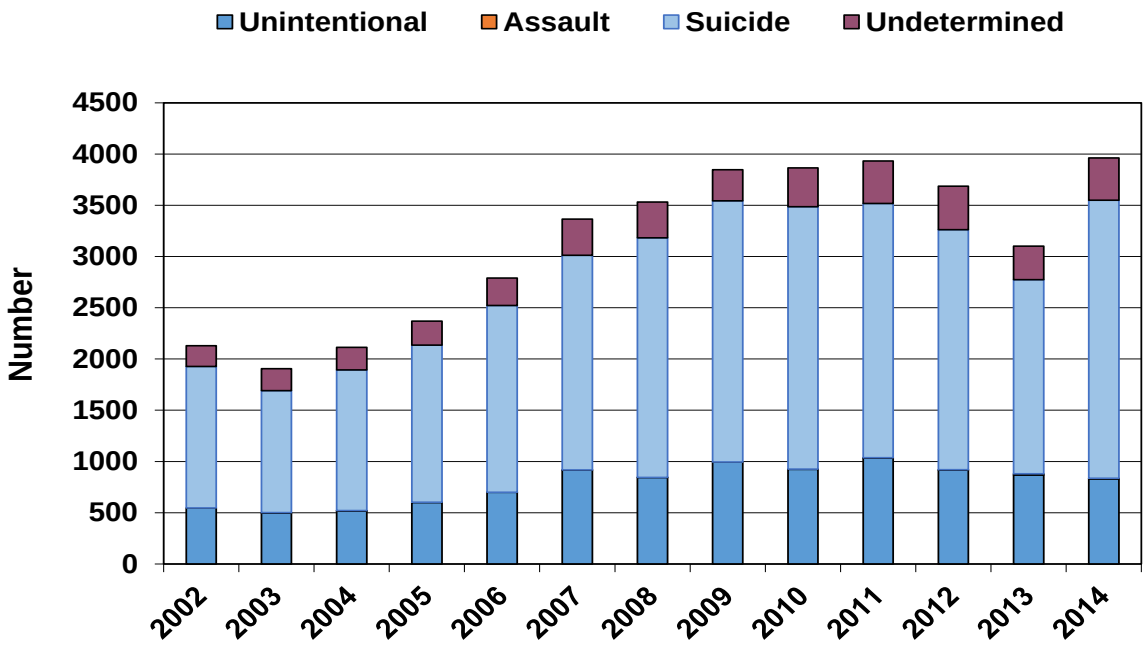


Figure 29. Number of Hospitalizations Due to Poisoning by Year and Intent, 2002-2014 (Hospital Discharge Data - Inpatient)

With the exception of a slight decrease in 2013, the rates of hospitalization from poisonings have remained relatively stable since 2009 after increasing two-fold since 2003. The proportion of poisonings from suicide, unintentional, and undetermined causes have followed a similar trend. The most common type of hospitalized poisoning cases were a result of suicide or suicide attempt.

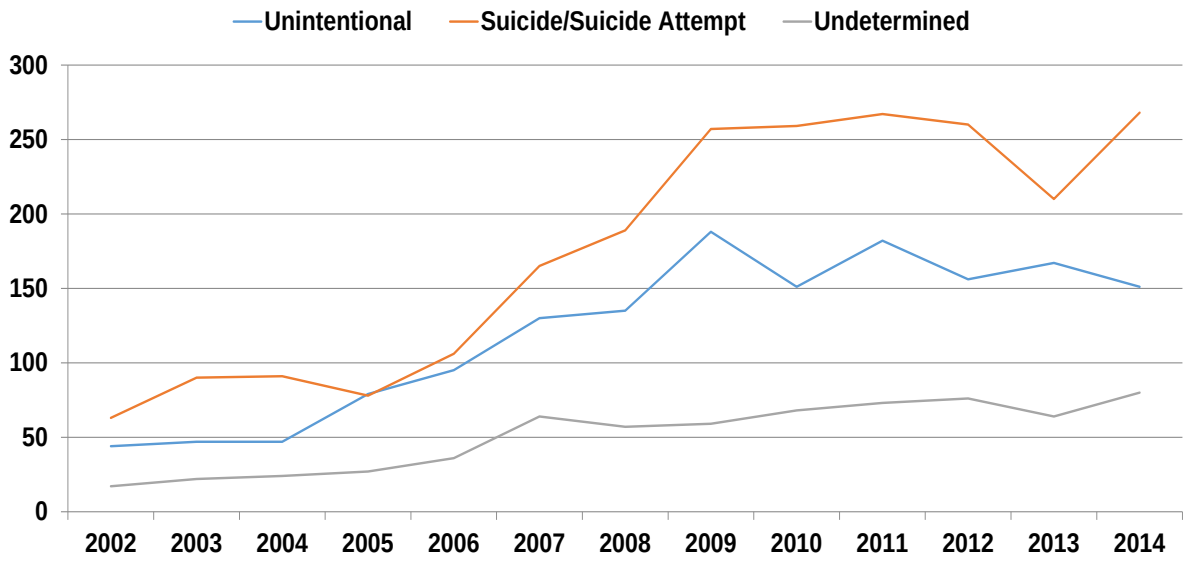


Figure 30. Number of Hospitalizations Due to Prescription Opioid Overdose by Year and Intent (2002-2014 Hospital Discharge Data – Inpatient)

The number of hospitalizations due to prescription opioid overdose has plateaued since 2009. Suicide or attempted suicide is the most common type of hospitalization from prescription opioid overdose. While there was a slight dip in 2013, the number of cases in 2014 increased to previous years' number of cases (268 cases). There was, however, a slight decrease in unintentional overdoses (151 cases). Undetermined type of hospitalizations from prescription opioid overdose has been relatively stable, with 80 cases in 2014.

Appendix

A) Data Sources

Data used in this report were primarily comprised of Death Certificate Data (2010-2014), Hospital Discharge Data (Inpatient, 2014; EMS Data, 2014; and State Trauma Registry Data, 2014 and Hospital Indicator trend comparison based on 2014 vs. 2010-2014).

1. *Death Certificate data (includes Iowa residents that died in Iowa)*:
The Bureau of Vital Statistics at the Iowa Department of Public Health collects and compiles Iowa residents' and nonresidents (those that died in Iowa, but were residents of other states) death certificates, which are classified by external cause of death. In compliance with the CDC recommendations, this report used the underlying-cause-of-death field to identify the injury deaths (decedents that had an external cause of death code based on ICD-10 (International Classification of Diseases-10th Revision).

2. *Hospital Discharge Data (Inpatient; includes Iowa residents and nonresidents seen at Iowa hospitals*):
Data included in this report were based on all trauma-related incidents (ICD-9-CM codes 800-959). The injury and external cause of injury codes were classified according to the 9th Revision of the International Classification of Diseases Clinical Modification (ICD-9-CM).

It should be noted that hospital discharge data is record-based; thus, a patient may have multiple visits (records) for the same injury. Thus, the numbers presented in this report were from a patient's first visit only.

3. EMS Data:
Based on trauma-related EMS runs (911 calls and treated/transferred by EMS only) in Iowa (2014).

4. State *Trauma Registry:*
The State Trauma Registry provides information about who becomes injured and how, and about the eventual outcome of each patient's care in Iowa, which assists the evaluation of trauma care for the injured persons. Injured patients from Level I – III hospitals (2010-2014) are included in the indicator section of the report, and all other data depicted are based on 2014 STR data.

April 2013

OUT OF HOSPITAL TRAUMA TRIAGE DESTINATION DECISION PROTOCOL-ADULT

The following criteria shall be utilized to assist the EMS provider in the identification of time critical injuries, method of transport and trauma care facility resources necessary for treatment of those injuries

Step 1 - Assess for Time Critical Injuries: Level of Consciousness & Vital Signs

Glasgow Coma Score ≤13
Respiratory rate <10 or >29 breaths per minute, or need for ventilatory support.
Systolic B/P (mmHg) less than <90 mmHg

If ground transport time to a Resource (Level I) or Regional (Level II) Trauma Care Facility is less than 30 minutes, transport to the nearest Resource (Level I) or Regional (Level II) Trauma Care Facility. If greater than 30 minutes, ground transport time to Resource (Level I) or Regional (Level II) Trauma Care Facility, transport to the nearest appropriate Trauma Care Facility. If time can be saved or level of care needs exist, tier with ground or air ALS service program

If step 1 does not apply, move on to step 2

Step 2 - Assess for Anatomy of an Injury

All penetrating injuries to head, neck, torso and extremities proximal to elbow or knee
Chest wall instability or deformity (e.g., flail chest)
Suspected two or more proximal long-bone fractures
Crushed, degloved, mangled, or pulseless extremity
Amputation proximal to wrist or ankle
Partial or full thickness burns > 10% TBSA or involving face/airway
Suspected pelvic fractures
Open or depressed skull fracture
Paralysis or Parasthesia

If ground transport time to a Resource (Level I) or Regional (Level II) Trauma Care Facility is less than 30 minutes, transport to the nearest Resource (Level I) or Regional (Level II) Trauma Care Facility. If greater than 30 minutes ground transport time to Resource (Level I) or Regional (Level II) Trauma Care Facility, transport to the nearest appropriate Trauma Care Facility. If time can be saved or level of care needs exist, tier with ground or air ALS service program

If step 2 does not apply, move on to step 3

Step 3 - Consider Mechanism of Injury & High Energy Transfer

Falls
—Adult: > 20 ft. (one story is equal to 10 feet)
High-risk auto crash
— Interior compartment intrusion, including roof: >12 inches occupant site; >18 inches any site
— Ejection (partial or complete) from automobile
— Death in same passenger compartment
— Vehicle telemetry data consistent with high risk of injury
Auto vs. pedestrian/bicyclist thrown, run over, or with significant (>20 mph) impact
Motorcycle crash >20 mph

Transport to the nearest appropriate Trauma Care Facility, need not be the highest level trauma care facility.

If step 3 does not apply, move on to step 4

Step 4 - Consider risk factors:

Older adults
— Risk of injury/death increases after age 55 years
— SBP<110 might represent shock after age 65 years
— Low impact mechanisms (e.g. ground level falls) might result in severe injury
Anticoagulants and bleeding disorders
— Patients with head injury are at high risk for rapid deterioration
Pregnancy > 20 weeks
EMS provider judgment
ETOH/Drug use

Transport to the nearest appropriate Trauma Care Facility, need not be the highest level trauma care facility.

If none of the criteria in the above 4 steps are met, follow local protocol for patient disposition. When in doubt, transport to nearest trauma care facility for evaluation.

For all Transported Trauma Patients:
1. Patient report to include: MOI, Injuries, Vital Signs & GCS, Treatment, Age, Gender and ETA
2. Obtain further orders from medical control as needed.

April 2013

PEDIATRIC	OUT OF HOSPITAL TRAUMA TRIAGE DESTINATION DECISION PROTOCOL	PEDIATRIC

The following criteria shall be utilized to assist the EMS provider in the identification of time critical injuries, method of transport and trauma care facility resources necessary for treatment of those injuries

Step 1 - Assess for Time Critical Injuries: Level of Consciousness & Vital Signs

Abnormal Responsiveness: abnormal or absent cry or speech. Decreased response to parents or environmental stimuli. Floppy or rigid muscle tone or not moving. **V**erbal, **P**ain, or **U**nresponsive on AVPU scale.
OR
Airway/Breathing Compromise: obstruction to airflow, gurgling, stridor or noisy breathing. Increased/excessive retractions or abdominal muscle use, nasal flaring, stridor, wheezes, grunting, gasping, or gurgling. Decreased/absent respiratory effort or noisy breathing. Respiratory rate outside normal range.
OR
Circulatory Compromise: cyanosis, mottling, paleness/pallor or obvious significant bleeding. Absent or weak peripheral or central pulses; pulse or systolic BP outside normal range. Capillary refill > 2 seconds with other abnormal findings.
Glasgow Coma Score ≤13

If ground transport time to a Resource (Level I) or Regional (Level II) Trauma Care Facility is less than 30 minutes, transport to the nearest Resource (Level I) or Regional (Level II) Trauma Care Facility. If greater than 30 minutes, ground transport time to Resource (Level I) or Regional (Level II) Trauma Care Facility, transport to the nearest appropriate Trauma Care Facility. If time can be saved or level of care needs exist, tier with ground or air ALS service program

If step 1 does not apply, move on to step 2

Step 2 - Assess for Anatomy of an Injury

All penetrating injuries to head, neck, torso and extremities proximal to elbow or knee
Chest wall instability or deformity (e.g., flail chest)
Suspected two or more proximal long-bone fractures
Crushed, degloved, mangled, or pulseless extremity
Amputation proximal to wrist or ankle
Partial or full thickness burns > 10% TBSA or involving face/airway
Suspected pelvic fractures
Open or depressed skull fracture
Paralysis or Parasthesia

If ground transport time to a Resource (Level I) or Regional (Level II) Trauma Care Facility is less than 30 minutes, transport to the nearest Resource (Level I) or Regional (Level II) Trauma Care Facility. If greater than 30 minutes ground transport time to Resource (Level I) or Regional (Level II) Trauma Care Facility, transport to the nearest appropriate Trauma Care Facility. If time can be saved or level of care needs exist, tier with ground or air ALS service program

If step 2 does not apply, move on to step 3

Step 3 - Consider Mechanism of Injury & High Energy Transfer

Falls: >10 feet or two times the height of the child
High-risk auto crash
— Interior compartment intrusion, including roof: >12 inches occupant site; >18 inches any site
— Ejection (partial or complete) from automobile
— Death in same passenger compartment
— Vehicle telemetry data consistent with high risk of injury
Auto vs. pedestrian/bicyclist thrown, run over, or with significant (>20 mph) impact
Motorcycle crash >20 mph

Transport to the nearest appropriate Trauma Care Facility, need not be the highest level trauma care facility.

If step 3 does not apply, move on to step 4

Step 4 - Consider risk factors:

Pregnancy > 20 weeks
EMS provider judgment
ETOH/Drug use
Anticoagulants and bleeding disorders
—Patients with head injury are at high risk for rapid deterioration
Transport to the nearest **(Any Level)** Trauma Care Facility

If none of the criteria in the above 4 steps are met, follow local protocol for patient disposition. When in doubt, transport to nearest trauma care facility for evaluation.

For all Transported Trauma Patients:
1. Patient report to include: MOI, Injuries, Vital Signs & GCS, Treatment, Age, Gender and ETA
2. Obtain further orders from medical control as needed.